



# Applications of Novel Materials for Civil Works Infrastructure

## Problem

As the age of USACE civil works infrastructure extends beyond its originally designed service life, deterioration of construction materials such as concrete and steel becomes a prevalent problem for many Districts. As infrastructure deteriorates, maintenance and repair is necessary to maintain acceptable performance. Many materials currently provided by manufacturers or recommended in guidance do not meet the structural, serviceability, and durability requirements necessary to extend the life of our existing infrastructure. Novel materials represent a new paradigm for materials selection with the potential to greatly improve the performance of our civil works infrastructure at a reduced cost and also to impart new capabilities such as self-sensing for integral structural health monitoring.

## Approach

This research leverages previous R&D investments by working to transition novel materials developed for military engineering and civil works applications to answer the operational needs of aging civil works infrastructure. Materials considered include advanced cement-based materials such as ultra-high performance concrete and rapid repair cements; metallic materials with improved strength and corrosion resistance; advanced polymeric materials with improved mechanical properties and durability; and potentially self-sensing materials. Stakeholder-identified operational needs and materials issues are correlated with potential novel materials solutions. Many of these novel materials were originally developed for military engineering applications and are now being transitioned to answer the needs of our civil works infrastructure. Laboratory-based studies optimize material properties and investigate the feasibility for repair and retrofit. Collaborations with USACE Districts are leveraged to investigate novel material feasibility in field demonstration projects and to develop guidance on using novel materials for various applications.

## Products

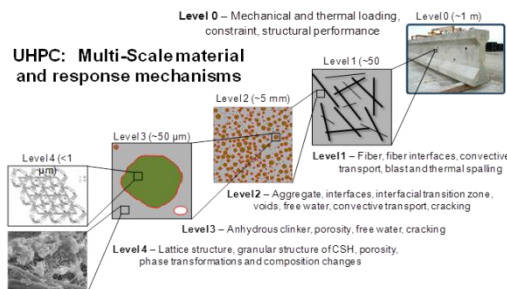
This research will produce publications and presentations related to novel materials and their applications in laboratory and field demonstration projects. Guidance will be developed that leverages novel material developments and identifies relevant repair and retrofit applications.

## Benefits

Novel materials have the potential to increase the performance and durability of aging USACE civil works infrastructure, reducing maintenance needs and possible structure closures.

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### Ultra-High Performance Concrete



### Materials for Rapid Repair of Infrastructure

